Version of the amended claims with markings to show changes made:

(Once Amended) 16. The apparatus of claim 15 wherein [in operation ] the high pressure processing chamber [operates at supercritical conditions] is a supercritical processing chamber.

(Once Amended) 17. The apparatus of claim 15 wherein [in operation ] the high pressure processing chamber [operates below supercritical conditions] is a non-supercritical processing chamber.

## REMARKS

The Applicants respectfully request further examination and favorable consideration in view of the amendment set forth above and the remarks set forth below. Claims 1-17 were pending. Within the Office Action, claims 1, 4-7, 9, and 14 were rejected under 35 U.S.C. § 102(b). Claims 2-3, 8, 10-13, and 15-17 were rejected under 35 U.S.C. § 103(a). Within the Office Action, Claims 16 and 17 were rejected as drawn to intended use. Claims 16 and 17 have been amended. Accordingly, Claims 1-17 are now pending.

## ARGUMENT

Rejections Under 35 U.S.C. § 102

*The Present Invention*

The present invention is a high pressure chamber for processing a semiconductor substrate. The high pressure chamber comprises a chamber housing, a platen, and a mechanical drive mechanism. The chamber housing comprises a first sealing surface. The platen comprises a region for holding the semiconductor substrate and a second sealing surface. The mechanical drive mechanism couples the platen to the chamber housing. In operation, the mechanical drive mechanism separates the platen from the chamber housing for loading the semiconductor substrate. In further operation, the mechanical drive mechanism causes the second sealing surface of the platen and the first sealing surface of the chamber housing to form a high pressure processing chamber around the semiconductor substrate.

*Claims 1, 4-7, 9, and 14*

Within the Office Action, Claims 1, 4-7, 9, and 14 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Number 5,314,574 to Takahasi (Takahashi). Within the Office Action, it is stated:

> Takahashi discloses a high pressure chamber (Col 1 line 22) for processing semiconductor substrates comprising a first sealing surface (Fig 1-7), a platen for holding semiconductor substrates and a second sealing surface (Fig 1-19), grooves and O-ring seal (Fig 1-21) and a mechanical drive mechanism (Fig 1-24) being a

piston driven by a compressible fluid (Col 4 line 50-52) to close and seal the surface to a spacer (Fig 1-20) to form a processing chamber around the substrate.

As described below, Takahashi does not disclose each element recited in Claims 1 and 14. Accordingly, Takahashi does not anticipate Claims 1 and 14.

Takahashi teaches an apparatus that removes oxidation film from a semiconductor wafer. Takahashi teaches forming a process chamber by raising an intermediate cover and then raising an open/close cover. In operation, the apparatus defines multiple chambers formed in multiple steps. First, a wafer is loaded onto a platform in a preparatory chamber. (Takahashi col. 5, lines 51-56) The chamber is defined by an open/close cover making a seal with a container. (Figure 6) Next, a first air cylinder raises the platform into an intermediate chamber. (Takahashi, col. 5, lines 66-67) The platform makes a seal with a shoulder of the container. (Figure 7) Next, a second air cylinder raises the open/close cover so that a ceiling cover helps define a treatment chamber in which a treatment gas coats the wafer. (Takahashi, col. 6, lines 9-11) Thus, Takahashi discloses processing chambers formed by the operation of two air cylinders, which, in operation, continually make and break two separate seals.

In contrast, Claim 1 of the present invention recites a drive mechanism that both "separates the platen from the housing for loading of the semiconductor substrate and further such that in operation . . . causes the second sealing surface of the platen and the first sealing surface of the chamber housing to form a high pressure processing chamber around the semiconductor substrate." Because a single drive mechanism is used to load an unload the chamber, as well as form the high-pressure processing chamber, the invention in Claim 1 advantageously reduces the number of sealing surfaces created by the drive mechanism. This structure thus reduces the probability of forming an imperfect seal compared to the structure disclosed in Takahashi.

Because Claim 1 does not contain each element taught in Takahashi, Takahashi does not anticipate Claim 1. Claim 1 is allowable in light of Takahashi. Furthermore, because Claims 4-7 and 9 depend from Claim 1, they are allowable as depending from an allowable base claim.

Claim 14 recites structure similar to that in Claim 1 and thus distinguishes over Takahashi for the same reasons as Claim 1. For example, Claim 14 recites a "mechanical drive mechanism [that] causes the means for sealing, the platen, and the chamber housing to form a high pressure processing chamber around the semiconductor substrate." As described above,

Takahashi discloses two drive mechanisms to form the processing chamber. Thus, for the same reasons described above in relation to Claim 1, Claim 14 is allowable over Takahashi.

*Claims 1, 4-5, 7-9, and 14*

Within the Office Action, Claims 1, 4-5, 7-9, and 14 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Number 5,979,306 to Fujikawa *et al.* (Fujikawa I). Within the Office Action it is stated:

> Fujikawa et al disclose a high pressure chamber for processing semiconductor substrates comprising a first sealing surface (Fig 2-5 upper sealing surface), a platen for holding semiconductor substrates and a second sealing surface (Fig 2-5 lower sealing surface), grooves and O-ring seal (Fig 2-9) and a mechanical drive mechanism (Fig 1-24) being a piston driven by a compressible fluid (Fig 6-103) and a non compressible fluid (Fig 6-102 and Col 1-line 64-67 and Col 2-line 46-53) and to close and seal the surface to form a processing chamber around the substrate.

As described below, Claims 1 and 14 do not contain each element taught in Fujikawa I. Accordingly, Fujikawa I does not anticipate either Claim 1 or Claim 14.

Fujikawa I teaches a high-pressure gas processing apparatus that can be used to process devices such as silicon wafers. Fujikawa I teaches a high-pressure vessel that has multiple components, which house wafers during processing; an actuator that can move the vessel's multiple components in an axial direction; a heater located within the vessel; a means for introducing gas into the vessel; sealing means for sealing the vessel so that gas does not escape during processing; and pressing means for pressing the vessels's components in the axial direction, ensuring that no gas leaks from the vessel during operation.

Claim 1 does not include each element taught in Fujikawa I. Fujikawa I teaches an actuator. Fujikawa I describes the actuator as an element for raising and lowering the lower and upper members of the vessel so that a workpiece can be loaded into the vessel. (Fujikawa I, col 5, lines 48-53) This actuator is separate from the pressing means (recited, for example, in Claim 1 of Fujikawa I) used to closely fit the lower member to the upper member to form a closed vessel. (Fujikawa I, col 5 line 64 to col. 6 line 2; col. 6 lines 38-43). Fujikawa I ostensibly uses this configuration to achieve a design goal--it can use one pressure and thus one gas source for the pressing means and the sealed processing chamber, a design that demands that the surface

area of the pressing means be larger than that of the platen. (*Id.*, col. 4, lines 27-42; col. 6, lines 33-43) Such a design, however, requires a separate actuator to move the chamber elements apart and together, for loading and unloading a wafer.

In contrast, Claim 1 recites a single element to raise and lower the wafer platen so that the chamber can be loaded and unloaded, as well as sealed, with a single drive element. Thus, because Claim 1 does not recite an element taught in Fujikawa I, Claim 1 is not anticipated by Fujikawa I. Accordingly, Claim 1 is allowable over Fujikawa I. Furthermore, because Claims 4-5 and 7-9 depend from Claim 1, they are allowable as depending from an allowable base claim.

Claim 14 recites structure similar to that in Claim 1 and thus distinguishes over Fujikawa I for the same reasons as Claim 1. For example, Claim 14 recites a "mechanical drive mechanism [that] causes the means for sealing, the platen, and the chamber housing to form a high pressure processing chamber around the semiconductor substrate." As described above, Fujikawa I discloses two drive mechanisms to form the processing chamber. Thus, for the same reasons described above in relation to Claim 1, Claim 14 is allowable over Fujikawa I.

Rejections under 35 U.S.C. § 103

*Claims 2-3*

Within the Office Action, Claims 2-3 were rejected under 35 U.S.C. § 103 as being unpatentable over Takahashi in view of U.S. Patent Number 5,798,126 to Fujikawa *et al.* ("Fujikawa II"). Within the Office Action it is stated:

> Takahashi discloses seal on the spacer but not on the first surface.
> Fujikawa et al teach a high-pressure chamber with several ways of sealing and disclose (Fig 7) two surfaces sealing to each other through spacer (27) having o-ring grooves and seals in both surfaces.
> Therefore it would have been obvious for one with ordinary skill in the art at the time [the] invention was made to have a groove and seal in first surface so as to keep the seal clean.

The Applicants respectfully traverse this rejection.

Within the Office Action, it is not stated whether Takahashi or Fujikawa II is used to teach the apparatus recited in Claim 1, from which Claims 2-3 depend. Because within the Office Action, Fujikawa II is not discussed in relation to Claim 1, it is assumed that Takahashi is

relied on to anticipate those elements recited in Claim 1. However, as described above, Takahashi does not teach the mechanical drive mechanism recited in Claim 1. Accordingly, the combination of Takahashi and Fujikawa II does not teach each element recited in Claim 1, and Claim 1 is allowable over Takahashi in view of Fujikawa II. Moreover, because Claims 2-3 depend from Claim 1, they too are allowable as depending from an allowable base claim.

*Claims 8 and 10-12*

Within the Office Action, Claims 8 and 10-12 were rejected under 35 U.S.C. § 103 as being unpatentable over Takahashi in view of U.S. Patent Number 5,898,727 to Fujikawa *et al.* ("Fujikawa III"). Within the Office Action it is stated:

> Takahashi discloses an air (compressible) cylinder but does not disclose the possibility of hydraulic (incompressible) cylinder or motorized actuator.
> Fujikawa et al disclose other driving means for a linear actuator, like hydraulic and motorized (Col 6 line 45-56). It is well known that a motorized actuator uses a screw for changing rotary motion to a linear one.
> Therefore it would have been obvious for one with ordinary skill in the art at the time [the] invention was made to use hydraulic or motorized actuator with a screw so as to have fast opening and closing operation without jitters.

Within the Office Action, it is not stated whether Takahashi or Fujikawa III is used to teach the apparatus recited in Claim 1, from which Claims 8 and 10-12 depend. Because within the Office Action, Fujikawa III is not discussed in relation to Claim 1, it is assumed that Takahashi is relied on to anticipate those elements recited in Claim 1. However, as described above, Takahashi does not teach the mechanical drive mechanism recited in Claim 1. Accordingly, the combination of Takahashi and Fujikawa III does not teach each element recited in Claim 1, and Claim 1 is allowable over Takahashi in view of Fujikawa III. Because Claims 8 and 10-12 depend from Claim 1, they too are allowable as depending from an allowable base claim.

*Claim 13*

Within the Office Action, Claim 13 is rejected under 35 U.S.C. § 103 as being unpatentable over Takahashi in view of U.S. Patent Number 6,067,728 to Farmer *et al.* ("Farmer"). Within the Office Action it is stated:

> Takahashi does not disclose a clamp to keep the two parts of the high-pressure chamber sealed together during processing.
> Farmer et al disclose clamps on both sides of [a] high-pressure chamber (Fig 30-520 and 550 and Col 6 line 31-34).
> Therefore it would have been obvious for one with ordinary skill at the time the invention was made to sue a clamp to hold the two parts hermetically sealed during processing at high pressure.

Within the Office Action, it is not stated whether Takahashi or Farmer is used to teach the apparatus recited in Claim 1, from which Claim 13 depends. Because within the Office Action, Farmer is not discussed in relation to Claim 1, it is assumed that Takahashi is relied on to anticipate those elements recited in Claim 1. However, as described above, Takahashi does not teach the mechanical drive mechanism recited in Claim 1. Accordingly, the combination of Takahashi and Farmer does not teach each element recited in Claim 1, and Claim 1 is allowable over Takahashi in view of Farmer. Because Claim 13 depends from Claim 1, it too is allowable as depending from an allowable base claim.

*Claims 15-17*

Within the Office Action, Claims 15-17 were rejected under 35 U.S.C. § 103 as being unpatentable over Takahashi in view of U.S. Patent Number 6,077,053 to Fujikawa *et al.* ("Fujikawa IV"). Within the Office Action it is stated:

> Takahashi discloses a pressure chamber frame (Fig 1 25, 17 and 24 combined), a piston coupled to the pressure chamber frame (24)[.]
> Takahashi does not expressly disclose the inside of the fluid cylinder to show [a] first fluid cavity defined by the piston body attached to the frame and the piston and the second fluid cavity defined by the piston neck and [the] pressure chamber frame.
> It is inherent and obvious to have two fluid cavities in a fluid cylinder, one on the side of the neck and the other on the other side of the piston to be used to move the piston one way or the other using differential pressure. As an example, Fujikawa [IV] discloses this in a gas compressor using pistons (Fig 2 – region H being second cavity and behind R5 being first cavity).
> Claims 16 and 17 are drawn to an intended use and are not patentable.

Claim 15 recites, in part, a piston and a sealing plate. The piston is coupled to a pressure chamber frame and comprises a piston body and a piston neck. The pressure chamber frame and the piston body form a first fluid cavity. The sealing plate is coupled to the pressure chamber

frame, and, together with the pressure chamber frame, the piston body, and the piston neck, forms a second fluid cavity.

Within the Office Action it is stated (1) that Takahashi discloses a pressure chamber and (2) that it is inherent to have two fluid cavities in a fluid cylinder. Notably absent is any statement that there exists a teaching, suggestion or motivation to alter Takahashi to contain two fluid cavities recited in Claim 13. Accordingly, the Office Action does not make a prima facie case of obviousness. *In re Mills*, 916 F.2d 680, 682 (Fed. Cir. 1990) (to support an obviousness rejection, there must be a teaching, suggestion, or motivation to combine references); *see also* M.P.E.P. 2143.01 (for a rejection under § 103 to stand, it is not sufficient that references can be combined or modified; the references must suggest the combination or modification). Because the Office Action does not make a prima facie case of obviousness, Claim 15 is allowable. Moreover, because Claims 16-17 depend from Claim 15, they too are allowable as depending from an allowable base claim.

Within the Office Action it is also stated that Claims 16 and 17 are drawn to intended use and thus are not patentable. In response to this ground for rejection, both Claim 16 and Claim 17 have been amended. Claim 16 now recites, in part, "wherein the high pressure processing chamber is a supercritical processing chamber." Claim 17 now recites, in part, "wherein the high pressure processing chamber is a non-supercritical processing chamber." As amended, Claims 16 and 17 now recite allowable structure rather than intended use. Accordingly, the rejection of Claims 16 and 17 as reciting intended use should be withdrawn.

## CONCLUSION

For the reasons given above, the Applicants respectfully submit that claims 1-17 are distinguishable over the cited references and are in condition for allowance. Allowance at an early date would be appreciated. If the Examiner has any questions or comments, he is encouraged to call the undersigned at (408) 530-9700 so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
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